Physics 131
General Physics I
Grinnell College

Homework V

Session V.1

1. I am located at a position 5 m east and 3 m north (5,3) of my origin. I move 3 m west, and 10 m south. What is my new location relative to the origin? [Give your answer in (x,y) format.] What is my distance away from the origin?

2. Consider the vector going from the origin to (1,5). What are the two possible vectors perpendicular to this vector that have the same length as (1,5)? You may wish to use a sketch, but give your final answer also in (x,y) format.

3. Starting at the origin, I am moving at 3 m/sec for 5 seconds in a direction 30º above the positive x axis. What is my location in (x,y) format at the end of those 5 seconds?

Session V.2

4. A 500 g cart rolls frictionlessly down a board inclined at 15˚ to the horizontal.

a. What is the component of the gravity force along the board?
b. What is the acceleration along the board?
c. What is the position of the cart along the board as a function of time, if the cart starts at the top at rest (call the distance along the board s, and start the cart at s = 0)?
d. Find the x and y components of position as a function of time. Why doesn't the y component of the motion have an acceleration of -g?

5. I throw a ball to a friend of mine. I throw it at an angle of 45˚ to the horizontal, at a velocity of 10 m/sec. My friend is 10 m away from me. How long does it take for the ball to reach her?

6. President Kington has a secret life as a professional bowler. He renovated Nollen house to install a bowling alley on the second floor. One day, he rolled a particularly wicked one which broke right through the wall. It came out of Nollen house moving horizontally at a velocity of 15 m/sec at a height of 4 meters above the ground.

a. How long does it take before the ball hits the ground?
b. How far out onto the lawn does the ball go (i.e. how far away from the wall is it when it hits the ground)?